THE DENTAL PRACTITIONER

AND DENTAL RECORD

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THE DENTAL PRACTITIONER
AND DENTAL RECORD

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THE DENTAL PRACTITIONER AND DENTAL RECORD

Vol. XI, No. 12 August, 1961

EDITORIAL

DENTAL MECHANICS

THERE is a serious shortage of dental technicians in this country, especially of the gifted craftsman. In 1952 there were 7000; to-day there are probably less. Dental schools find it difficult to fill vacancies in both the prosthetic and orthodontic departments, and the majority are managing with smaller establishments than necessary for efficient teaching. Even the private practitioner often seeks in vain.

The implications of this trend if it is not halted and reversed will be serious in relation both to the treatment of the patients and the training of dental students. Several schools are expanding and will require additional first-class technicians to teach and to execute the mechanical work for patients. The increasing number of graduates will call for an increase in the number of technicians to carry out the work in practice. In all schools the standard of prosthetics and orthodontics has been rising steadily and graduates are going into practice taught to expect high-quality work from their technicians; many of them look in vain outside some of the better-known commercial laboratories.

A large backlog of orthodontic treatment is building up, and while patients are not yet finding it difficult to obtain prosthetic treatment, unless recruitment to the craft of dental mechanics is increased this day may not be far distant. As the age of the existing population rises so will the demand for dentures increase.

What are the causes of this shortage? They are fivefold: First, the uneconomic fees allowed for prosthetics under the National Health Insurance scheme. Secondly, technicians employed by hospitals and local authorities are underpaid in relation to the skill which they possess. Whitley Council scales commence at £500 per annum and rise to only £885 per annum for a senior highly skilled craftsman supervising a large staff and carrying a considerable responsibility. These wages compare unfavourably with those which comparable workers in industry can obtain. Thirdly, the working conditions of many technicians are appalling, the conception of a dental laboratory having advanced little since the days of the last century. Fourthly, the method of training dental technicians by apprenticeship is grossly out of date. Fifthly, the competent dental technician is finding that his skill enables him to obtain well-paid work in industry.

The time has come for the dental profession to consider seriously what course it proposes to take to ensure that in the future a sufficient number of competent technicians is available.

The answer is to develop a profession with training facilities and competitive conditions

of employment which attract a steady flow of suitable young men.

The apprenticeship system is a poor method of teaching since it relies on a busy craftsman sparing valuable time and effort. It must be replaced with a full-time course of training, possibly of about three years' duration. Already a few interested practitioners and teachers in London and some of the larger provincial cities are working to create a training course for dental technicians, with possible assistance from the Technical Colleges and Dental Schools.

THE DENTAL PRACTITIONER hopes that their labour will bear fruit. Their success, however, can only be assured if the whole profession faces up to the problems involved and is prepared to provide adequate financial backing and attractive salaries. The Government must also be prepared to include dental technicians in the proposals made in its White Paper "Better Opportunities in Technical Education".

LUPUS ERYTHEMATOSUS

This is a systemic disease characterized by acute or chronic dermatosis. Wiener's classification is:—

1. Cutaneous: Apart from disfigurement, the patient's welfare is not disturbed.

2. Systemic: Known as malignant lupus erythematosus and is rare and usually fatal.

3. Cutaneous form with systemic exacerbation: The systemic form here appears as a complication of a pre-existing cutaneous one and the prognosis is better than that of the primarily systemic form. Patients with systemic complications are to be treated with extreme care and surgical procedures are to be undertaken along with cortisone therapy and antibiotics.

Case Report.—One of the two cases reported was a married woman, aged 23 years, with a well-kept mouth who in February, 1955, appeared to be healthy. In June of the same year she attended, complaining of a sore mouth. Desquamated areas were seen around the gingivæ of the right upper premolars and the buccal mucosa has an appearance not unlike leucoplakia. A day later similar lesions of the gingivæ occurred in the corresponding area of the opposite side of the mouth. Pain was not a complaint, but the areas were tender to brush and from the effect of condiments. The patient had lost weight between the two dates, but looked and felt well. A search for a cause of the lesions was fruitless and reference was made to a periodontist. After two weeks, during which time the oral symptoms persisted, the patient was seen by a dermatologist because of a rash which had appeared on the arms and chest. An immediate diagnosis of lupus erythematosus was confirmed by the presence of the L.E. cell in the blood picture (this phenomenon consists of a rosette of neutrophils surrounding a pale nuclear mass apparently derived from a lymphocyte and it appears when blood serum of a person suffering from the disease is added to normal blood). Six weeks later the patient died from renal failure. A few days before death she was seen to have lost much more weight, to have the "death's head" appearance of lupus, to have frequent gingival hæmorrhages, and the whole of the mouth was intensely inflamed.

The case is of interest in that "no reports of initial lesions appearing on the gingival tissues have been found in the literature" (LITE, T. (1953), *J. Periodont.*, **24**, 119). It is stressed that atypical oral lesions should receive the fullest investigation and that local dental treatment may mask symptoms and so delay proper and essential treatment.—BARNETT, A. V. (1961), *Aust. dent. J.*, **6**, 41.

G. E. B. MOORE

PALATELESS DENTURES

By G. MacL. RITCHIE, L.D.S. R.C.S.
Dental Prosthetics Department, University College Hospital, London

This paper describes the results obtained with palateless dentures in 51 edentulous patients, and an attempt is made to decide which type of case can be successfully treated by this method.

Various impression materials were used to determine whether a mucostatic or a "muco-compressive" (displacement) technique gave better results. Advantages and disadvantages associated with the design are given below.

Fig. 1.—A favourable case which has good ridges and tuberosities with steep distal slopes, marked to indicate buccal extension.

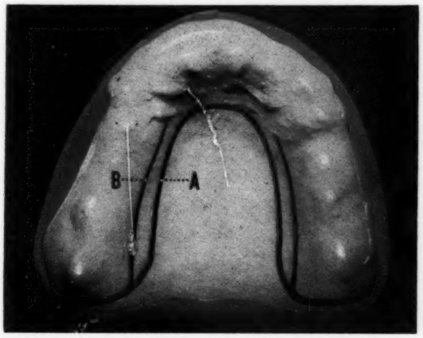

Fig. 2.—A cast marked for a palateless denture. A, Peripheral dam line; B, Bilge keel line.

ADVANTAGES

Minimum coverage of the palate is greatly appreciated by patients who are intolerant of a complete covering of the hard palate. Reduction in bulk results in more tongue space, and exposure of part of the palate allows greater thermal appreciation and quality of taste. The number of broken dentures is reduced and stability improved in cases with a large torus palatinus in the posterior two-thirds of the hard palate.

Further advantages have been claimed: namely, that a reduction in denture weight is beneficial to retention (Booth, 1946), by covering less of the palate a smaller area of mucous membrane becomes inflamed (Booth, 1946) and pressure on the posterior palatine nerves is prevented (Hawkes, 1945).

None of these claims can be substantiated. The benefit obtained by a reduction in weight, which is very slight in a plastic denture, is more than offset by the loss in retention due to a smaller surface area which results in a reduction in adhesion and cohesion. Mucous membrane under a full denture does not normally become inflamed providing the denture is stable, a good fit, kept clean, and not worn at night. The third claim can be discounted since normally tissue thickness in this region is sufficient to cushion any pressure effect, which in any case would be greater for a palateless than for a conventional denture.

DISADVANTAGES

Not all cases can be supplied with successful palateless dentures, since certain retentive features, described later, are necessary. These plates are rather fragile in the midline where a labial frænum is attached near the crest of the ridge, especially when combined with a large incisive papilla.

Reduction in surface area lessens the retention factors, adhesion, and cohesion.

SELECTION OF CASES FOR SURVEY

The cases were selected at random from the waiting list without regard to suitability.

Fifty-one cases were undertaken, 30 women and 21 men, their ages ranging from 18 to 67 years. Of this number 26 had previous denture experience.

TECHNIQUE AND DESIGN

The patients were divided into four groups according to the material and technique used for impression taking.

Group A.—Stock tray composition with a thin alginate wash. This is a "muco-compressive" or displacement technique, which means that soft tissue is being subjected to a distorting force and when released will exhibit a soft tissue recoil. Soft tissue is not compressible, but pressure can drive tissue fluid from the intercellular spaces; it is this fluid attempting to re-enter these spaces that causes the soft tissue recoil.

Group B.—Plaster in special trays provides an almost completely mucostatic technique by which no displacement or distorting pressure is put on the tissues.

Group C.—Zinc oxide eugenol impression paste in special trays. A slightly "compressive" technique; the amount of displacement depends on the clearance of the tray and the viscosity of the paste.

Group D.—Alginate in a special tray is an almost completely mucostatic technique, especially when used in a perforated tray.

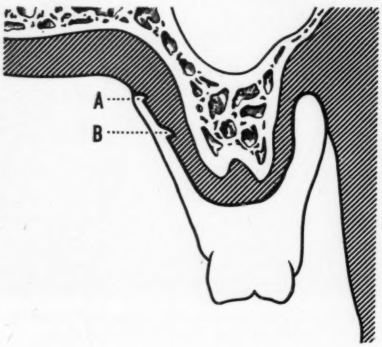

Fig. 3.—Cross-section of palateless denture in the mouth. A, Peripheral dam; B, Bilge keel, note angulation.

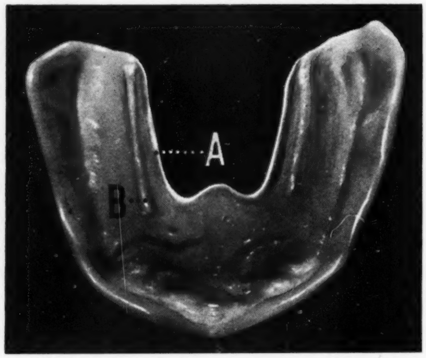

Fig. 4.—The fitting surface of a palateless denture. Note: A, Dam lines; B, Keels.

The dentures were planned to extend to the full depth of the sulcus, completely covering the distal aspect of the tuberosities up to the pterygoid notch (*Fig.* 1). Fræna were left completely uncovered and tori, where present on the anterior third of the palate, were relieved as required. The lateral walls only of the palate were covered and pin-dammed at the periphery. This was done by cutting a narrow trough about 0·5 mm. wide and deep from the pterygoid notch of one side to that of the other with shallower damming over a relieved torus (*Fig.* 2).

"Bilge keels" or spur lines were cut into the model approximately 1·0–1·5 mm. deep and 0·5–1·0 mm. wide with reference to soft tissue on the lateral walls of the palate. The pin dam improves peripheral seal and allows the palatal edge of the denture to be thinned so that the periphery of the denture blends with palatal mucosa and does not irritate the tongue (*Figs.* 3 and 4).

Bilge keels assist in preventing lateral and anteroposterior rock, and aid retention (Ritchie, 1959; Vine, 1951).

Dentures were processed with a complete full palate to avoid a midline fracture in deflasking. The centre portion between the palatal pin dam lines was removed with a fret-saw and kept in order to facilitate replacement of the palate if this should become necessary at a later date.

All plates were constructed in acrylic and most were set up on rational (free plane) articulators, free occlusion being the minimum requirement.

GROUP ANALYSIS

Results obtained with palateless dentures and features of cases contained in each group are given in *Tables I* and *II*. The failures are discussed under group headings.

Cases were deemed to be a good result only if both patient and surgeon considered the denture perfectly satisfactory with regard to comfort, retention, stability, and masticatory efficiency.

Table I.—Analysis of Results

		Results		
Group	Months Worn	Good	Satisfactory	Failure
A	14	3	11	1
B	10	8	6	2
C	8	7	7	1
D	3	2	3	—
Total		20	27	4

Those cases considered satisfactory by the patient, but where the surgeon was of the opinion that some slight improvement was desirable, were classified as satisfactory.

Table II contains a list of factors which may influence the prognosis of a denture, but it is interesting to note that the number of cases with conditions considered unfavourable for palateless dentures is greater than the actual number of unsuccessful cases.

Group A.—The case considered a failure had a flat palate with a fairly large torus on the anterior two-thirds of the palate. Non-attendance for inspection combined with cuspal interference resulted in considerable resorption of the alveolar ridge with subsequent loss of fit.

Group B.—The failures were attributed to anatomical unsuitability for retention of this type of denture. One had a flabby and shallow upper ridge with a flat palate, the other a very flat palate, but some labial undercut was present. Restoring palates to these dentures immediately improved retention and the cases were brought to a satisfactory conclusion.

Group C.—One case could be regarded as fairly satisfactory; excessively undercut tuberosities were responsible since severe easing of the denture in this region resulted in loss of retention. The peripheries in this region were carefully extended with greenstick composition to obtain peripheral seal with the cheeks which improved retention and made the denture both comfortable and usable. In two cases with profuse salivation the retention, poor at first, rapidly improved after wearing for a few days.

SUMMARY

Most patients can be fitted with satisfactory palateless dentures, but the clinical impression is that the retention is not as good as with a full palate denture.

It has been noted that cases considered failures owing to poor retention were immediately successful when the palates were replaced.

Profuse salivation did not adversely affect retention; no case with an excessively dry mouth was treated.

DISCUSSION

There are three conditions where the construction of a palateless denture might be advised, providing other conditions prove satisfactory:—

1. Intolerance of the palate to a full coverage denture, a condition frequently psychogenic in origin.

2. The presence of a palatal lesion or large torus palatinus on the posterior two-thirds of the hard palate frequently indicates that avoidance of the area is a wise procedure.

3. In some cases a large and mobile tongue may be better accommodated when the majority of the palate has been omitted from the denture.

Cases unsuitable for this type of denture are those exhibiting:—

1. Poor ridges, either small, flabby, or with knife edges.

2. Shallow vaulted palate.

3. Large anterior torus palatinus.

4. Fræna attached close to the crest of the ridge.

5. Patients with a habitual mandibular thrust.

Success will be met in the majority of cases if the following requirements are complied with:—

Large alveolar ridges and tuberosities, the latter with steep distal slope and no gross undercuts. Square or high vaulted palate with some soft tissue on the lateral walls. The torus palatinus should be absent, minimal, or confined to the posterior two-thirds of the palate. Fræna small and not attached too close to the crest of the ridge. Saliva favourable, i.e., not too copious or mucinous. The dentures should exhibit balanced or at least free occlusion.

Table II.—Factors affecting Denture Prognosis

	Group A	Group B	Group C	Group D
Number of males Number of females *Total*	9 6 15	6 10 16	5 10 15	1 4 5
Age range (years)	27–61	36–60	18–67	44–64
Number with previous denture experience	6	11	8	1
Classification of bite:—				
Class I	14	15	15	5
Class II	1	—	—	—
Class III	—	1	—	—
Saliva Quantity	13 Moderate 2 Copious	15 Moderate 1 Copious	11 Moderate 4 Copious	5 Moderate —
Consistency	1 Serous 3 Mucinous	— —	4 Serous —	— 1 Mucinous
Palate	4 Flat 3 Deep	2 Flat —	2 Flat —	— —
Torus on anterior third of palate	1 Large 14 Average	2 Large 11 Average 3 Nil	— 15 Average —	— 5 Average —
Ridge form other than normal	3 Small 2 Irregular	2 Small 3 Irregular 1 Flabby	2 Small —	— 1 Irregular
Gross undercut	2	—	1	—
Tuberosities:— Size	2 Large 11 Average 2 Shallow	4 Large 9 Average 3 Small	7 Large 6 Average 2 Flat	1 Large 4 Average —
Undercut	4 Moderate 4 Slight	5 Moderate 2 Slight	5 Slight 1 Excessive	2 Slight —
Fræna:— Very broad	1	—	—	—
Attached at ridge crest	2	1	—	—

CONCLUSION

For the majority of patients it is possible to construct palateless dentures that are adequate in function, but the degree of stability and retention depends on the anatomical form of the base or denture-bearing area and the provision of a balanced or at least a free occlusion.

The tuberosity where large, slightly undercut with a steep distal angle, greatly favours retention. Small, flabby ridges or a flat vaulted palate should be avoided. It is important to leave the frœna uncovered and place the anterior teeth so that they do not interfere with the functional movements of the orbicularis oris.

A traumatic or locked occlusion will rapidly result in damage to the ridge, resorption, and subsequent loss of fit.

Provision of keels greatly assists in retaining and stabilizing the plate, resulting in no apparent damage to the mucosa, although the possibility cannot be entirely excluded. Biopsies from keel areas are being investigated histologically and will be the subject of a future communication.

Acknowledgements.—The author wishes to thank Professor A. S. Prophet and Mr. A. E. Everett for advice in the preparation of this paper, and Mr. V. K. Asta and Mr. A. C. Lees of University College Hospital Medical School for the illustrations.

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Dental Products containing Glass Fibre

Glass fibre and fabric have been applied to restorative and prosthetic materials in dentistry.

A silicate cement to which glass fibre has been added was tested by the Bureau; it meets the official Australian requirements in regard to setting time, strength, solubility, and translucency. However, it is considered that these desirable properties are due to the quality of the unmodified silicate cement and not to the addition of glass fibre. It seems that the fibres would need to be much longer to influence the strength and this would render the product unsuitable as a filling material. Recently improved silicate cements without glass fibre are somewhat stronger and less soluble.

Direct filling resins incorporating glass fibre exhibit insignificantly less thermal expansion than the ordinary cold-curing resins and are just as disappointing in service.

Glass fibre has been suggested as a possible strengthener for acrylic dentures. It has been shown, however, that the effect of a foreign material embedded in the resin tends to reduce its strength. This is due to the introduction of internal stress in the region of the incompatible material. However, it is possible to build up a denture base using glass mesh which has been treated with resin to make it more compatible. In this case there is a very high proportion of glass, and the resin which is added is there more in the nature of a bonding and water-resisting material. In prosthetic resins, therefore, glass fibres, unless present in sufficient quantity to interact with one another, are to be regarded as potential weakeners and not strengtheners.—COMMONWEALTH BUREAU OF DENTAL STANDARDS (1960), *Aust. dent. J.*, **5**, 260.

G. E. B. MOORE

DENTAL RADIOGRAPHY

A TWO-DAY course in dental radiography has been arranged for dental nurses and assistants, to take place on Thursday and Friday, Sept. 14 and 15, 1961, at the Ilford Limited Department of Radiology and Medical Photography, Tavistock House North, Tavistock Square, London, W.C.1. No fee is charged for this course. Application forms will be sent on request.

THE KEY RIDGE IN CEPHALOGRAPHS

By **V. S. IYER,** B.D.S., L.D.S., D.D.O. (Glasg.), F.D.S. R.C.S. (Edin.)
Professor and Head of the Department of Orthodontia, Sir C. E. M. Dental College and Hospital, Bombay

THE information obtained from cephalometric tracings and measurements is valuable in appraising an orthodontic case. It is therefore necessary that any landmark is carefully ascertained and that the tracing is accurate. Frequently it is noticed that a number of points like S (centre of sella turcica), A (the point of maximum concavity between the anterior nasal spine and the alveolar process of the maxilla), and B (the point of maximum concavity between the alveolar process of the mandible and pogonion) are arbitrarily located. The difficulty is increased when the landmark itself has to be traced arbitrarily too often. For instance, even the accurate outline of the teeth and orbit is difficult to determine because their shadows are indistinct and blurred in the cephalograph. Naturally, this induces a personal error in every cephalometric tracing as a number of outlines are "imagined".

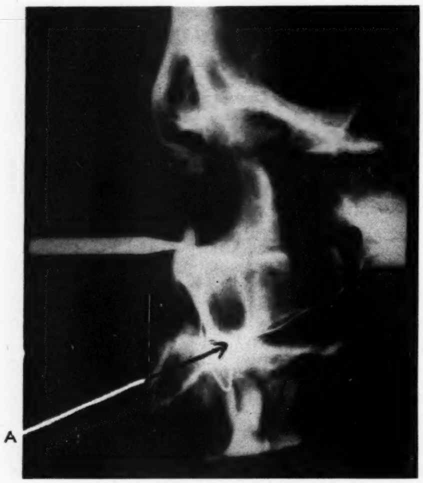

Fig. 1.—Cephalograph showing J-shaped radiopaque shadow, the lower part of which represents the key ridge (A).

The key ridge is one of the landmarks that is traced, and its tracing is very variable. It is noticed on the cephalograph as a roughly J-shaped radiopaque shadow behind and below the orbit (*Fig.* 1). The lower curved limit of the J is taken as the key ridge and it is related to the position of the upper molars. Salzmann (1950) describes the key ridge as "a strong bony buttress which descends downward and forward from the zygoma to the maxillary bone, often covering the roots of the first and second molars. When the dental arches are in correct mesiodistal relationship in the adult, this ridge lies directly over the mesiobuccal root of the maxillary first permanent molar."

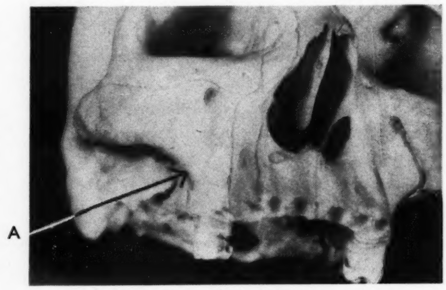

Fig. 2.—Front view of skull showing key ridge (A) separating the anterior from posterior surface of zygomatic process of maxilla.

Fig. 3.—U-shaped loop of wire outlining the anatomical key ridge on the skull.

The importance of the key ridge was first shown by Atkinson (1939), who considered it as a fixed point in the maxilla with which the relationship of the mesiobuccal root of the maxillary molar may be described. Thus the key ridge is used as an important diagnostic landmark.

Brash (1951) states in regard to the zygomatic process of the maxilla: "Its anterior and posterior surfaces are separated from each other by a rounded, concave ridge that fades away at the socket of either the first or the second molar tooth." Evidently during clinical examination for locating the key ridge, palpation picks up this ridge as described by Brash. Therefore, this ridge and the one described by Salzmann are one and the same.

It was very often found that the clinical finding of the relationship of this ridge to the root of the molar and the cephalometric finding (*Fig.* 1) (tracing of J shadow outline) do not correspond. Since in clinical palpation there is likelihood of error, dried skulls were taken for a careful appraisal of the key ridge—anatomically and cephalometrically.

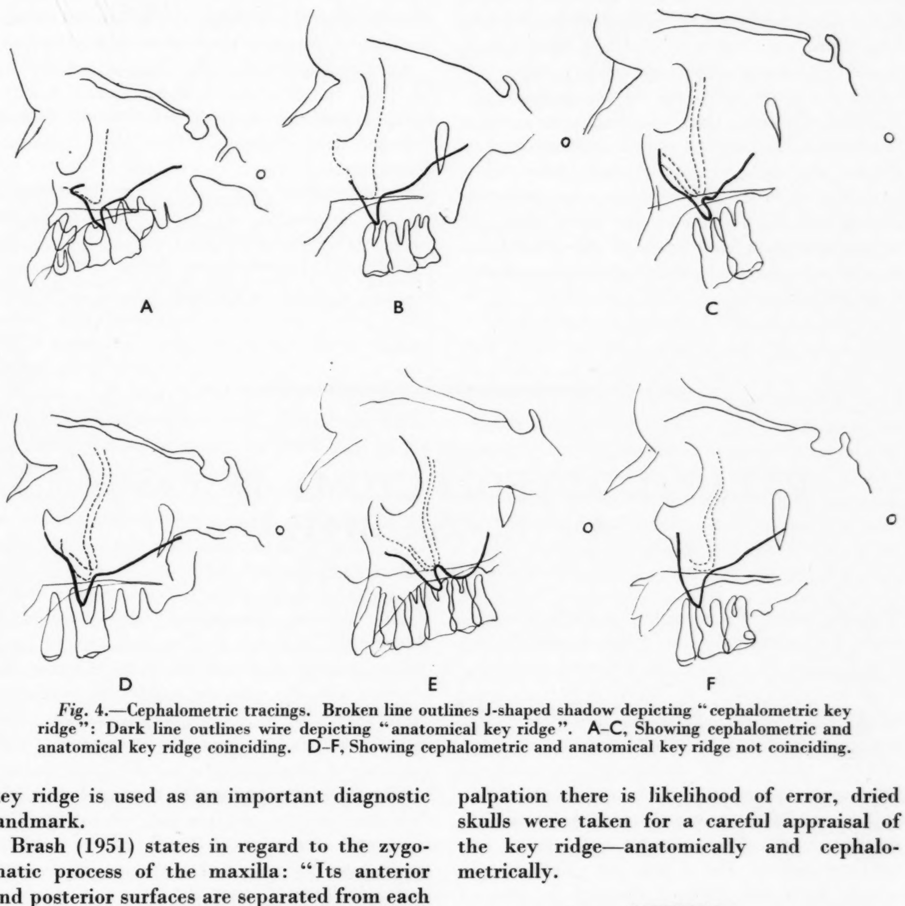

Fig. 4.—Cephalometric tracings. Broken line outlines J-shaped shadow depicting "cephalometric key ridge": Dark line outlines wire depicting "anatomical key ridge". A–C, Showing cephalometric and anatomical key ridge coinciding. D–F, Showing cephalometric and anatomical key ridge not coinciding.

METHOD

Six Indian skulls were used. The ridge (exactly separating the anterior from posterior surface of zygomatic process of maxilla), as described by Brash, was marked in pencil (*Fig.* 2), and then a soft stainless steel wire was adapted to outline the ridge (*Fig.* 3). Sagittal cephalometric radiographs were taken

with the wire in position and these were then traced.

RESULTS

Fig. 4 shows the tracings and depicts the relationship of the J-shaped shadow (broken line) which is commonly described as the key ridge, and the wire outline (dark line) which depicts the anatomically correct key ridge, but which does not show up on the radiograph. *Fig.* 4 A–C show that the J-shaped shadow represents the position of the anatomical key ridge. *Fig.* 4 D–F show that there is a variation between the cephalometric and the anatomical key ridge. It may also be mentioned that the ridge is directed more downward and backward rather than downward and forward.

CONCLUSION

It is suggested that if the J-shaped radiopaque shadow is to be utilized as a "cephalometric key ridge" landmark then it should be a subject of study in relation to the molars, and the results of the relationship of the anatomical key ridge to the molars should not be confused with the cephalometric finding.

Acknowledgement.—My thanks are due to Dr. H. S. Sheikh, B.D.S., L.D.S. C.P.S., Lecturer in Orthodontics, Sir C. E. M. Dental College and Hospital, for the technical assistance.

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PALATAL ALVEOLECTOMY IN CASES OF CLOSE BITE

By **D. C. WOOD**, L.D.S.

The provision of a maxillary prosthetic appliance for patients who have a close bite occasionally presents a considerable problem. This is particularly so when upper anterior teeth are to be extracted and the lower anteriors impinge upon the palate. A satisfactory method of treatment is outlined below.

The model is prepared as for immediate insertion, with teeth cut off and sockets cut into the plaster. The area in the palate around which the lower incisors impinge is scraped to a depth of about 2 mm.; the edge of this area is bevelled to give greater strength to the acrylic denture.

The denture is then finished in the normal way. On extraction, a muco-periosteal flap is raised by means of a midline incision in the palate and a semilunar incision across the sockets.

The palatal aspect of the alveolus is thoroughly exposed, and an amount of bone corresponding approximately to the amount scraped off the plaster model is removed, preferably with burs or rotary bone files. The interdental bone may be removed with rongeurs if necessary.

The flap is temporarily returned and the denture tried in, the patient is requested to bite, and if the cheek teeth fail to occlude more bone is removed until a satisfactory state of affairs is reached.

On completion, the area may be dusted or otherwise treated with an antibiotic, and the flap returned, no suture being required, since the denture will maintain the flap in position. The patient is instructed to keep the denture in position for 48 hours, when the case may be inspected and any small adjustments made.

THE HEALING PROCESS IN THE MARGINAL PERIODONTIUM AFTER GINGIVECTOMY, WITH SPECIAL REGARD TO THE REGENERATION OF EPITHELIUM*

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THE pathological changes which take place in the epithelium of the gingival pocket are of fundamental importance in the development of periodontal disease. The earliest of these are the inflammatory and regressive changes which take place in the underlying connective tissue and which are associated with degeneration of the epithelium. Later changes cause proliferation of epithelium down along the cementum with formation of a pathological pocket.

Almost all the local methods which are available for the treatment of this condition are designed to prevent or limit the apical proliferation of epithelium.

Surprisingly little has been done, however, to study experimentally the changes which take place after the most radical method of treatment available, the surgical elimination of the gingival tissues to the level of the base of the pocket, i.e., gingivectomy.

Most of the earlier investigations were carried out on humans (Lundquist, 1929; Orban and Archer, 1945; Bernier and Kaplan, 1947). The surgical intervention has, in most cases, been in periodontal tissues with marginal inflammation. The great advantage of such studies is that they give valuable information which can be directly related to clinical practice.

There are, however, certain disadvantages with this mode of procedure. If an experiment is carried out with a pathologically damaged tissue as a starting point, the premises for a comparison between the healing process in different cases are not ideal. This applies even if the operations are all carried out in the same individual or even in the same jaw. Pathological changes such as inflammation, degree of loosening, and depth of pocket frequently vary from tooth to tooth.

It would be of fundamental importance to investigate the healing process after gingivectomy in clinically healthy tissues (Waerhaug, 1955). This would show the different phases of healing of soft tissues under similar conditions and serve as a starting point for studies of pathologically affected tissues.

How does the epithelial regeneration of a wound on the surface of a mucous membrane take place? A number of authors have carried out investigations on the regeneration of the epithelium of the epidermis and the mucous membranes. The histological picture of epithelial healing in these two basic types of tissue shows both general and individual features. First, the wound is covered by a blood clot which rapidly becomes organized to granulation tissue. While this is going on, the cells from the deeper layers of epithelium begin to migrate over the surface of the wound, utilizing their property of amœboid movement (Cameron, 1952). After approximately two days, mitotic figures can be seen in the epithelium a short distance from the edge of the wound, and, as cell division proceeds, more and more cells grow out over the wound.

In later stages, a number of differences are apparent in the healing process in epidermis and mucosa. While epidermis continues with a relatively simple type of healing without any reconstruction of hair follicles, sweat glands, etc., a high degree of cell differentiation accompanies healing in mucous membranes. Even glands are formed in regenerating tissue (Florey, 1954). There also

* From a lecture given to the British Society of Periodontology on April 6, 1960.

seems to be a higher mitotic rate in the gingiva than in the epidermis (Marwah, Meyer, and Weinmann, 1956).

Investigations of the healing process in the gingival epithelium have been considerably fewer in number. Conditions affecting healing of a wound produced by gingivectomy are not quite comparable with those affecting healing in any other of the body's mucous membranes. The wound produced by gingivectomy has a fairly long and narrow surface area and one of the longer sides is bounded by hard tooth tissue, which means that regeneration takes place in virtually one direction in contrast to other mucous membranes where it takes place from all sides.

The aim of the present investigation was to answer the following questions:—

What is the character of the regenerating epithelial cells? How does the epithelium react in the early stages after a gingivectomy, and what relation do the epithelial cells bear, first to the blood clot and later to the granulation tissue? What is the relation of the epithelium to the hard tissues of the tooth when it has reached them?

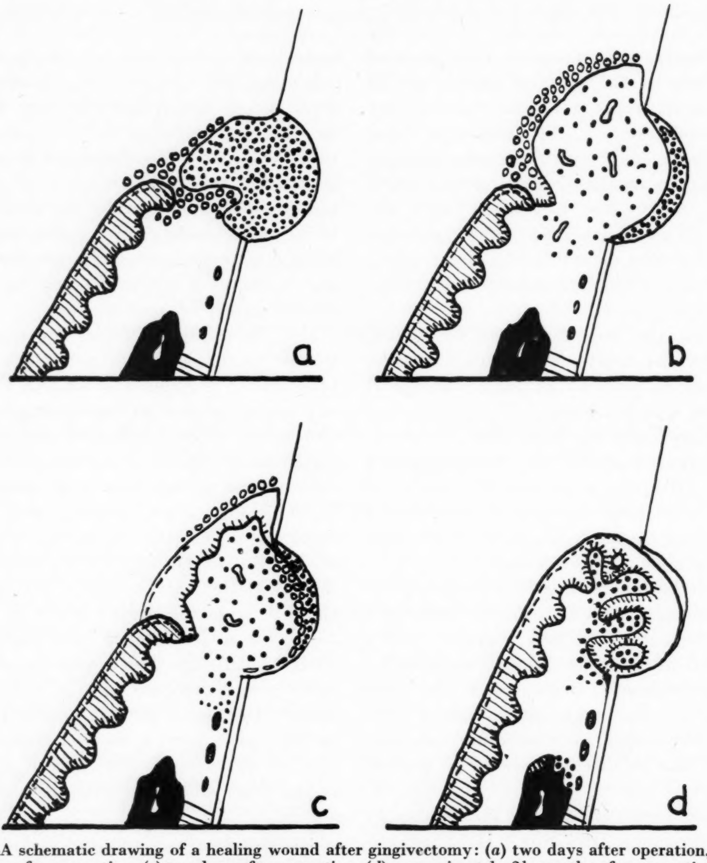

Fig. 1.—A schematic drawing of a healing wound after gingivectomy: (*a*) two days after operation, (*b*) six days after operation, (*c*) ten days after operation, (*d*) approximately 2½ months after operation.

METHOD

A number of dogs with clinically healthy gingivæ were used. A gingivectomy was performed on the facial aspect of one or more teeth to a depth of approximately 4 mm. from the gingival margin, in other words at about the level of the alveolar crest. In some cases the gingivectomy was more extensive and an alveolotomy was carried out to the level of the soft-tissue incision. A small groove was usually cut in the tooth to mark the apical limit of the incision. After operation, the wounds were left to heal undisturbed for different periods of time.

After varying time intervals, the animals were sacrificed and blocks containing the appropriate teeth and their surrounding tissues were removed. In this way preparations were obtained at almost daily intervals during the first 10 days after operation, then at 14 and 22 days, and finally at 1½, 2, and 2½ months after operation.

The blocks were fixed in 10 per cent neutral formalin, decalcified and embedded in paraffin wax. Serial sections 5 microns thick were cut and stained.

RESULTS

Ordinary Transmitted Light Microscopy.—For the sake of simplicity, a schematic representation of the healing process will be given first (*Fig.* 1). The histological investigation showed that two days after operation (*Fig.* 1 *a*) the wound is covered by a clot which extends into the groove. The epithelium at the outer border of the wound has begun to regenerate and send forth some free-lying cells from the basal layers. These cells seem to pass into the clot, separating off the outer part from that underneath. After six days the clot has been almost completely replaced by granulation tissue (*Fig.* 1 *b*). The granulation tissue now extends upwards in a swelling against the tooth so that a false pocket is formed. The regenerating epithelium has reached the highest point of this tissue. In the days immediately following, a mass of granulation tissue grows up against the tooth until it finally extends to about the original level. The old connective tissue becomes more and more infiltrated with inflammatory cells, especially near the tooth. The new epithelium continues to proliferate over the overgrowth

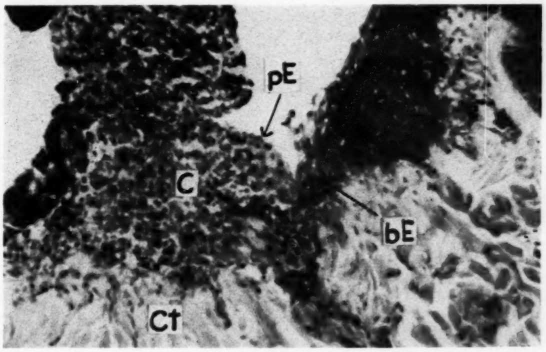

Fig. 2.—The healing wound two days after operation. Young cells (pE) from the basal layers of the old epithelium (bE) have begun to proliferate over and into the blood-clot (C). There is no evidence of inflammation in the connective tissue (Ct). (× 150.)

of granulation tissue and gradually extends over the surface against the tooth, and shows a tendency to pass in between the granulation tissue and the clot which remains in the bottom of the groove (*Fig.* 1 *c*). The granulation tissue in this region is gradually replaced by collagenous connective tissue and is markedly infiltrated with inflammatory cells. As the healing continues the inflammation gradually disappears from the old connective tissue and the outer border of the new. At the latest stage observed, 76 days, inflammation is, however, still well marked nearest the tooth with numerous plasma cells and lymphocytes. There has been a retraction of the overgrowth of connective tissue so that the final contour is nearly level with the groove (*Fig.* 1 *d*).

A study of blocks of tissue reveals that after 24 hours the deeper cells show, as yet, no tendency to migrate. A different appearance can be seen after two days (*Fig.* 2). The edge of the old epithelium can be seen clearly with, spreading from its basal layers, a short string

of epithelial cells different in appearance to those of the old epithelium. These cells are characteristically large and polygonal in shape with large pale-staining nuclei in which the nucleoli are prominent.

The cytoplasm is swollen and the cells give the impression of being loosely connected together. From the direction of the string of proliferating epithelium it would seem that the new epithelium tends to force itself into the clot rather than to grow round it.

This relationship of the new epithelium to the clot after four days' healing can be seen

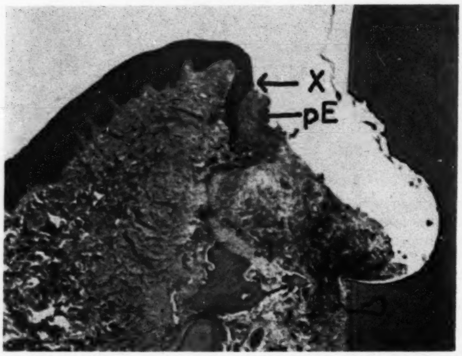

Fig. 3.—Four days after operation. The old epithelium has become folded in around the edge of the wound (at X). Proliferating epithelial cells at pE. (× 25.)

in *Fig.* 3. The old epithelium has become folded in around the edge of the wound. The new epithelium continues to grow out from the basal layers of the old and is composed of a considerably thicker layer (*Fig.* 4). This layer of young epithelium is composed of the typical free-lying polygonal cells with weakly-stained nuclei. Polymorphonuclear leucocytes lie between the cells of the new epithelium and very occasionally between those of the old layer. At the advancing edge there are some single epithelial cells which are isolated from the rest of the epithelial layer in the clot.

After six days the clot has been almost completely replaced by granulation tissue (*Fig.* 5). The border between the old connective tissue and the granulation tissue is well marked at the site of operation by a prominent process of epithelium which grows down into the connective tissue at the border between the new and the old epithelium. The granulation tissue, which is packed with polymorphonuclear leucocytes, now extends upwards in a swelling against the tooth so that a false

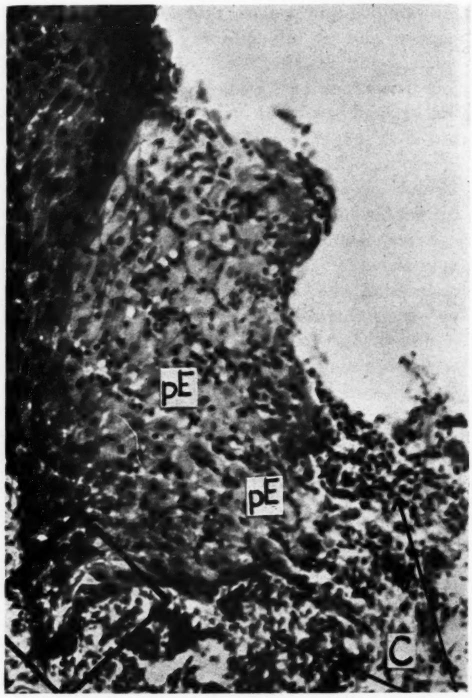

Fig. 4.—Four days after operation. A higher magnification of an area from *Fig.* 3 showing the edge of the wound. The proliferating epithelial cells (pE) have a loose arrangement and some of them have penetrated into the clot (C). (× 240.)

pocket is formed. The regenerating epithelium has reached the highest point of this tissue and there also the cells lie loose and have weakly-stained nuclei.

An interesting point is the irregular shape of the proliferating epithelial cells, which appears to be due to the lack of resistance as they force themselves forward. The clot offers little resistance and the cells are large, loosely connected, and polygonal in shape. As the blood-clot is separated off, the cells

spread out over the granulation tissue without meeting any resistance and so retain their irregular form.

In some cases it almost appears as if the reduction in resistance caused by the separation of the clot had caused an increased proliferation over the free surface of the granulation tissue (*Fig.* 6). The new cells have greatly distended cytoplasm and large weakly-stained nuclei in which the nucleoli and cell membranes are prominent. They lie very loosely and form a layer of unusual thickness. Indeed the whole picture is one of wild proliferation.

The epithelium continues down the soft-tissue wall of the gingival pocket with a relatively thin sheet of multi-layered squamous epithelium. This flattening-out of the proliferating epithelium down to the coronal edge of the groove was consistently observed in all the material taken from 6 to 8 days after operation onwards. The appearance of the cells which have passed the upper border of the groove, and have begun to grow into it, suggests that the resistance from the hard substance of the tooth controls the structure and method of growth of the proliferating epithelium. This latter grows in behind the clot, which offers little resistance as loosely-connected cells separate off the clot (*Fig.* 7).

Fig. 5.—Six days after operation. Granulation tissue has swelled up against the tooth and is being covered, on the oral side, by new epithelium. An epithelial "border process" has grown down at the junction between the old connective tissue and the granulation tissue (at X). (× 50.)

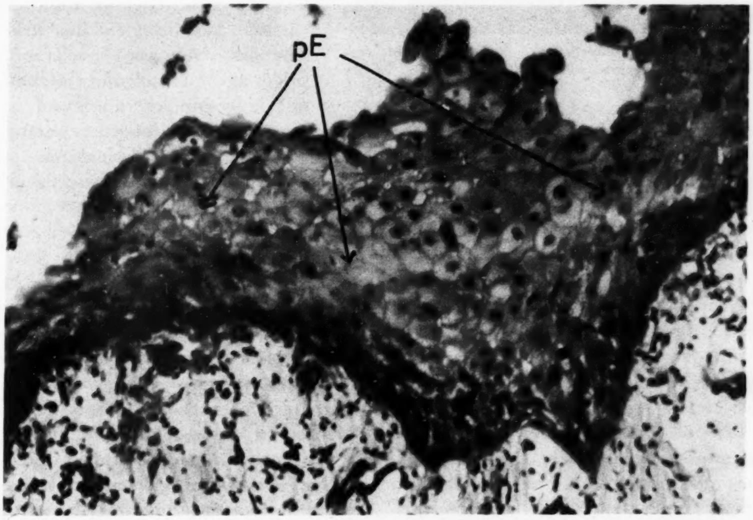

Fig. 6.—Seven days after operation. Young epithelial cells (pE) proliferating out over the granulation tissue. The epithelium has become thinned out as it nears the tooth to the left. (× 240.)

The old connective tissue becomes more and more infiltrated by inflammatory cells, especially nearest the tooth, and inflammation gradually extends down the periodontal membrane (*Fig.* 8). On the oral aspect, the epithelium has begun to differentiate into different layers. The epithelium spreads progressively deeper and deeper in between the clot and the granulation tissue until it has completely separated the two and reached the apical border of the groove.

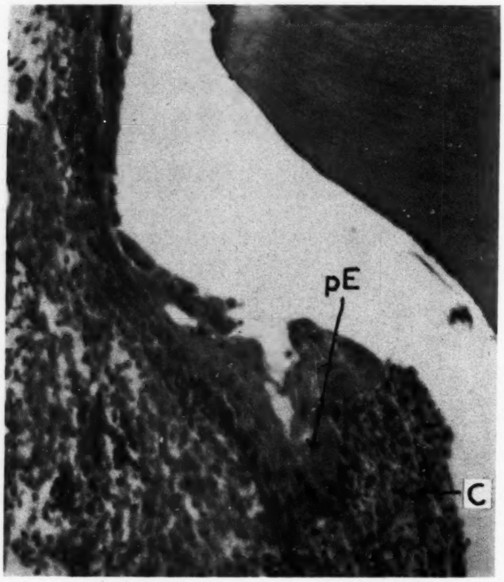

Fig. 7.—Nine days after operation. The proliferating epithelial cells (pE) have begun to cut off the clot (C) in the groove. (× 240.)

Some photomicrographs representing different stages in the healing process will serve to illustrate the further development. *Fig.* 9 shows the healing after 14 days. The granulation tissue has been replaced by collagenous connective tissue and inflammation has subsided in the oral parts. Nearer the tooth, however, pronounced inflammation persists.

On the oral aspect, the new epithelium differentiates into the usual layers. Very large epithelial processes do, however, extend down into the connective tissue round the groove, where the inflammation is most pronounced. A relatively thin layer of epithelium extends inwards to the lower border of the groove where it contacts the dentine just above the edge of cementum. Higher up the groove there are no epithelial cells and the dentine is covered partly by concrements and partly by remains of the clot.

Fig. 10 shows the stage of healing 22 days after operation. In the lower part of the groove the epithelium is attached to both cementum and dentine over a larger area than at earlier stages. The epithelium which is attached to the most apical part of the groove is composed of flattened epithelial cells, whilst that more coronally is composed of polygonal, younger cells, lying more loosely.

As time progresses, the inflammation in the old connective tissue and oral parts of the new gradually becomes reduced. Against the tooth, however, and particularly around the groove, there is still marked inflammation.

At the last stage observed, 76 days, the inflammation is still well marked nearest the tooth (*Fig.* 11). The pathological appearance of the pocket epithelium has been further accentuated. There are masses of cells of differing origin and form around the tooth. Most of these are in advanced stages of degeneration, many of them being inflammatory cells. In the apical portion of the groove there are epithelial cells which are still undamaged, the deeper ones being flattened and those above being polygonal in shape.

Fluorescence Microscopy.—The large epithelial process which grows down between the old connective tissue and the newly-formed granulation tissue about 6 days after operation is an interesting phenomenon (*Fig.* 5). It characterizes the healing from this stage onwards until, about 10–14 days after operation, it begins to become reduced in size.

Numerous investigations have shown that, in healing skin wounds, the edge of the wound is drawn inwards by a contraction caused by shortening of the underlying connective tissue

fibres (Florey, 1954). A similar contraction seems to occur in wounds in mucous membrane caused by gingivectomy, as can be seen in *Fig.* 3, which shows the state of healing after 4 days. Proliferation of the new epithelium begins from the turned-in edge and extends inwards and also out over the growing granulation tissue swelling (*Fig.* 12). For the first 6 to 10 days there is very active production of new epithelial cells here. This results in a more accentuated downgrowth of the process and a rapid epithelial proliferation out over the granulation tissue. The border process thus seems to function as a site for the production of epithelial cells during the earlier stages of healing. Later, after about 10 days, the border process becomes reduced in size and rete pegs of ordinary size appear in the new epithelium. These then seem to take over the production of new cells.

These observations cannot be made with the aid of the ordinary microscope with polychromatic light alone. The differences between very young and very old cells are sufficiently marked with diachromatic stains but intermediate stages are not usually distinguishable. In examining the epithelium covering a healing gingival lesion, it is of considerable interest to know the relative ages of the different cells. Fluorescence microscopy, which is a comparatively recent development, gives, in many cases, better differentiation of tissues than is possible with other methods.

In an attempt to study the origin of the epithelial cells in healing gingival wounds, a part of the present material was examined by fluorescence microscopy. This investigation was undertaken together with W. D. McHugh (McHugh and Persson, 1958).

Most tissues emit fluorescence ("primary fluorescence") when irradiated with ultraviolet light, but the emission is so weak in many of the soft tissues that it is of little use in microscopy. Staining the tissues with weak watery solution of certain dyes called fluorochromes gives them a high degree of fluorescence ("secondary fluorescence") and this is the method used in the present investigation. Details can be obtained from the paper by McHugh and Persson (1958).

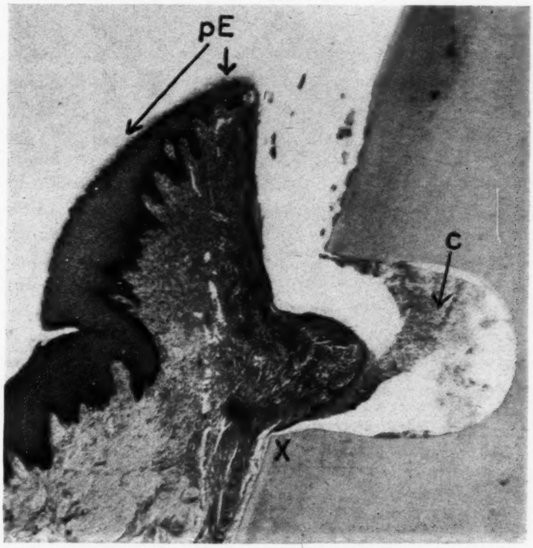

Fig. 8.—Ten days after operation. The new epithelium has reached the apical border of the groove (at X) and cut off the blood-clot (C). Young epithelial cells (pE) have grown back over the new layer of keratin. (× 40.)

In studying the growth of epithelium over a gingival lesion produced by experimental gingivectomy, it was found that healing took place in four stages. The stages were clearly observed but were, of course, continuous, with each stage merging into the succeeding one.

Stage One.—Two days after operation, epithelial cells could be seen in the edge of the clot covering the lesion. These cells appeared to have originated from the deeper layers of the epithelium at the edge of the lesion and to have oozed out into the clot. Mitosis was observed only in a few cases. This first stage corresponds to the first stage described by Florey (1954): "Cells from the lower layer of the skin edge or corresponding cells from other epithelium can slide across the surface".

To recognize this stage fluorescence microscopy is not necessary. It can be seen in ordinary polychromatic light (*Fig.* 2). Some

Fig. 9.—Fourteen days after operation. The pocket epithelium can be seen extending to the apical margin of the groove just above the cementum. (× 25.)

free-lying cells slide out into the clot. These cells, migrating from the edge of the wound, are few in number.

Stage Two.—The second stage is observed about four days after operation when cell division can be seen in the deeper layers some little distance from the edge of the lesion. Rapid proliferation of these deeper layers takes place to form an epithelial process which extends down into the connective tissue like an accentuated rete peg (*Fig.* 13). This process appears to act as a "factory" by producing epithelial cells to cover the healing surface of the lesion. The fine differentiation in cell age possible with fluorescence microscopy shows this very well. The centre and side of the "peg" next to the lesion appear to be almost entirely composed of young cells. The young darker-stained cells can be seen passing out of the upper part of the "peg" and through the deeper layers of the epithelium towards the healing edge of the lesion. As the cells reach the edge of the old keratinized epithelium they "bubble" up on to the surface (*Fig.* 14). Most of them pass out on to the surface of the granulating lesion but some are also seen to slide

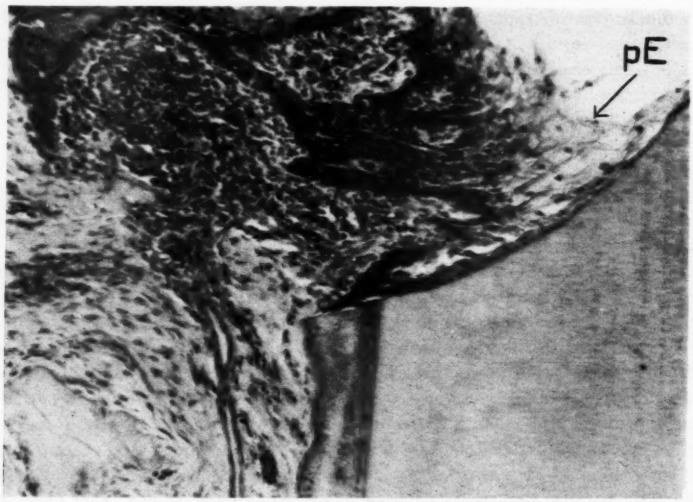

Fig. 10.—Twenty-two days after operation. In the apical part of the groove, epithelium has become fastened over a wide area to cementum and dentine. Flat epithelial cells next to the hard tissue. Above these, polygonal cells (pE) with loose connexion. (× 155.)

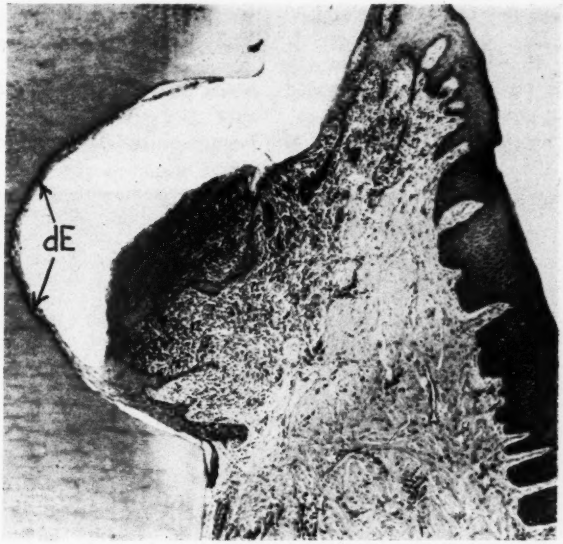

Fig. 11.—Seventy-six days after operation. Epithelium has become fastened to the dentine in the apical part of the groove and has proliferated a short distance along the cementum. Degenerated epithelial cells (dE) can be seen on the surface of the dentine in the more coronal part of the groove. There is marked inflammation and degeneration of the tissues in the groove. (× 65.)

Fig. 12.—Seven days after operation. The "peg" formation some little distance from the edge of the lesion. Proliferation of the new epithelium extends inwards and also over the granulation tissue swelling. (× 100.)

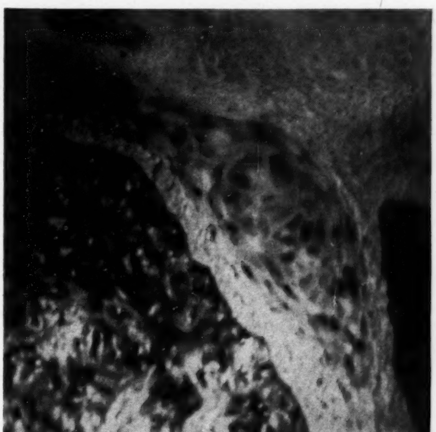

Fig. 13.—Nine days after operation. A fluorochromed specimen photographed in ultra-violet light. The cells in the upper central part of the "peg" can be seen to be rather large, dark, and loosely packed, and a "stream" of these cells can be followed through the deeper layers of the epithelium to the healing edge of the lesion which lies to the left. (× 125.)

back along the surface of the keratinized epithelium.

It seems likely that the stimulus for the production of this process may be provided by inflammatory products, as the "peg" always appeared at the edge of the area of

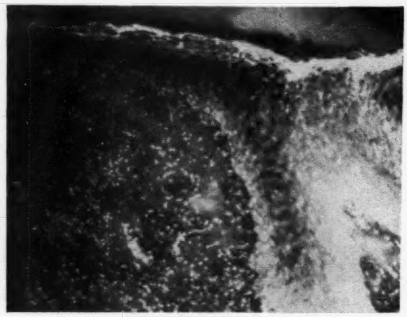

Fig. 14.—Eight days after operation. A fluorochromed specimen photographed in ultra-violet plus blue light. Dark-stained cells can be seen lying between the layers of the keratinized epithelium to the left. (× 93.)

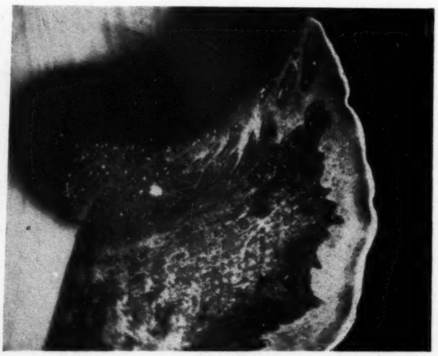

Fig. 16.—Fifty-seven days after operation. A fluorochromed specimen photographed in ultra-violet light. The layers of epithelium which lay next to the tooth have an entirely different appearance from the outer layers of keratinized epithelium. (× 38.)

inflammation (*Fig.* 14). Large numbers of inflammatory cells were present on the side of the "peg" containing most young cells.

In examining the epithelial cells overlying the granulation tissue in the earlier stages, it is seen that the epithelial cells on the surface are younger than those underneath (*Fig.* 15). From this it seems reasonable to assume that division of the epithelial cells covering the lesion does not occur in the early stages and that the cells originate from the "peg" formation and slide out over the surface of

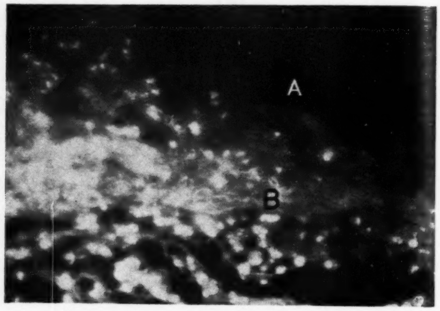

Fig. 15.—Seven days after operation. A fluorochromed specimen. Epithelial cells on the granulating surface of the lesion. The cells nearest the surface appear quite dark (A), while the deeper-lying cells (B) are somewhat lighter. (× 250.)

the cells already there. The production of epithelial cells by the "peg" appears to be the main source of cells for the healing lesion up to about the ninth or tenth day after operation.

Stage Three.—Cell division and proliferation of the deeper layers of the epithelium can usually be seen after the ninth day when these cells begin to form epithelial processes which extend into the connective tissue. Young epithelial cells are now produced in the deeper layers of the new epithelium and the large border process is no longer required and can be seen to be reduced in size. The new rete pegs have taken over the production of the proliferating epithelial cells, as can be seen in *Fig.* 8, taken in ordinary polychromatic light.

Stage Four.—This stage is characterized by excessive proliferation of epithelium on the side of the lesion nearest the tooth, and verges on the pathological. Large, thick epithelial processes extend into the connective tissue. Degeneration of the cells in the central areas of these processes was often observed.

As this excessive proliferation was never observed on the outer side of the healing lesion, it seems likely that it was caused by the conditions in the groove.

In specimens taken a fairly long time after operation (more than 50 days), it appeared, in sections stained with diachromatic stains, that the layer next to the tooth substance in the groove might be keratinized. Examination of this material in the fluorescence microscope showed, however, that these cells lying next to the tooth substance were not keratinized (*Fig.* 16). Some type of cell degeneration had taken place, but the strong secondary fluorescence found with keratinized epithelium was entirely absent.

CONCLUSION

This investigation was of a purely experimental nature and was designed to study the principles of epithelial regeneration, and related factors, in the marginal gingiva after gingivectomy. The methods used have been both ordinary transmitted light microscopy and fluorescence microscopy.

A small groove was usually cut in the tooth to mark the apical limit of the incision. It did, in some respects, interfere with the healing, and the extent to which it did this was determined by comparing cases with grooves with cases without. The groove was found to have complicated the healing process at later stages of healing. This complication does not appear to be due only to the presence of the actual groove but to the retention and protection it gives to the clot in the first place and later to food debris, bacterial plaques, and calculus. The groove has thus provided opportunities for studying the regeneration of epithelium in areas of severe inflammation, both acute and chronic, in later stages of healing.

The following observations were made:—

Two days after operation the epithelium begins to regenerate from the basal layers of the old epithelium. The new epithelium is composed of loosely-packed polygonal cells with swollen cytoplasm and large weakly-stained nuclei. After about six days the clot has been converted into granulation tissue and this gradually swells up against the tooth. The regenerating epithelium gradually proliferates out over the swollen granulation tissue until it has reached the coronal border of the groove in the tooth. After 8–10 days the epithelium has separated off the clot in the groove and reached the apical border of the groove. After the clot in the groove has disappeared, the epithelium produces young polygonal cells which proliferate coronally up into the groove. Some considerable time later a proliferation down along the cementum takes place.

The underlying connective tissue shows no signs of inflammation during the first days after operation but these appear after four days. For about 14 days the inflammation increases in intensity and extent and even involves the upper part of the periodontal membrane. Then it gradually diminishes and the granulation tissue becomes organized into collagenous connective tissue. In, and immediately around, the groove the inflammation persists for the whole of the experimental period. The epithelium against the tooth shows advanced signs of degeneration.

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BOOK REVIEWS

LES IMPLANTS SOUS-PERIOSTÉS EN PROSTHÈSE DENTAIRE. By GÉRARD MAUREL, Professeur de Chirurgie Maxillo-faciale à l'Ecole Odontologique de Paris. $9\frac{7}{8} \times 7\frac{1}{8}$ in. Pp. 126+x, with 140 illustrations. 1960. Paris: Librairie Maloine S.A. N.F. 30.00.

THE late Doctor Gérard Maurel, stomatologist of the Hôpitaux de Paris, Professor of Maxillo-facial Surgery at the School of Odontology of Paris, spent many years of his life studying and developing the technique of sub-periosteal implants. He was responsible for no less than twenty-three works on the subject.

The book is in concise French and the 120 pages of text are well illustrated by 140 figures. The work is wide in scope and catholic in outlook, including chapters on the classification and history of implants; details of formulæ and physical properties of various materials used for fabricating implants; the surgical and prosthetic techniques employed; exceptional techniques; the statistics of success and failure; and histological research and observations.

Doctor Maurel does not confine himself to a description of his own technique or to that of the French School, but draws freely from the literature and views of implantodontists from all over the world.

Because of the unavoidable delay in the preparation of scientific publications they are usually out of date before they get into print. In many fields of medicine and surgery this is not of very great moment, since development is slow, but with an art or science which is developing as rapidly as that of subperiosteal implantation, such delay is more than usually unfortunate. To quote statistics given by implant authorities as long ago as 1956 is of little value to-day.

Much of the text might be criticized in the light of modern American and British technical procedure. For instance, the routine cutting of deep grooves in the bone is to be deprecated because of the inevitable bone resorption which follows it. The use of Kerr's composition as the first stage in the bone impression is now out-moded and the author's design of the implant framework has little to recommend it, failing as it does to embrace those areas of cortical bone where pressure can best be borne, i.e., the external alveolar ridge, the symphysis, and the zygomatic process. The unsupported finger-like projections of the substructure as depicted in Figs. 24, 25, 128, 129, 134, 135, 136, and 139 do not uphold modern concepts of mechanical and biodynamic function.

In spite of its faults this book is well worth reading by the serious student or practitioner of sub-periosteal implants, if only because it provides a new perspective from which to view the more orthodox type of work produced in Great Britain and America.

F. B. T.

THE EXTRACTION OF TEETH. By GEOFFREY L. HOWE, M.R.C.S. (Eng.), L.R.C.P. (Lond.), F.D.S. R.C.S. (Eng.), Professor of Oral Surgery, University of Durham. $8\frac{1}{2} \times 5\frac{5}{8}$ in. Pp. 70+viii, with 100 illustrations. 1961. Bristol: John Wright & Sons Ltd. 17s. 6d.

THIS book is one that can be thoroughly recommended. It sets out to cover the extractions of teeth, both with forceps and cutting instruments under local and general anæsthetics, and it deals with this subject in a masterly manner, yet in a comparatively few pages. It is quite obvious from the way it is written that it is the work of one who has had considerable practical experience.

The illustrations on the whole are good; there are one or two that are not quite as clear as they might be, Fig. 37 being an example. It is, indeed, interesting to see a text-book advocate as orthodox practice what was in one's early days of practice regarded as a rather strange technique.

The book was a pleasure to read because of its style as well as its contents.

R. S. T.

RETRACTION OF UPPER BUCCAL SEGMENTS USING REMOVABLE APPLIANCES

By **VINCENT B. MORRIS**, B.D.S. (N.U.I.), F.D.S., D.Orth. R.C.S. (Eng.)
Senior Registrar, Orthodontic Department, Royal Dental Hospital, London

Retraction of upper buccal segments is required in about 7 per cent of all patients attending an orthodontic department for treatment. The types of malocclusion which require this form of treatment are varied, and the following are typical examples, all having the common factor that half a unit or less distal movement is required:—

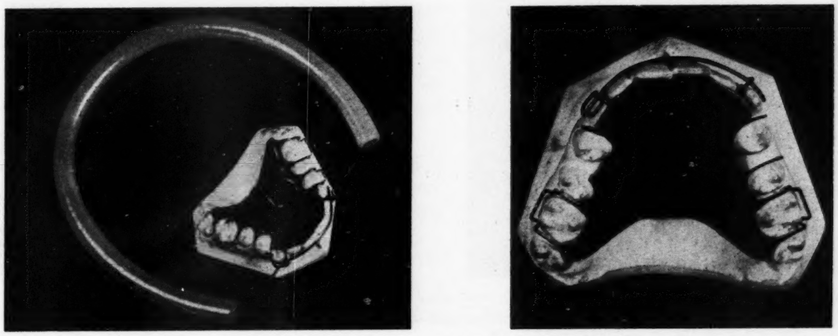

Fig. 1.—Shows the appliances used, which have been described previously.

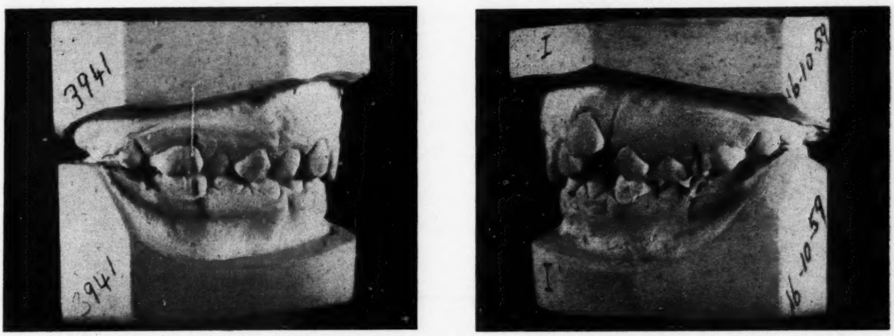

Fig. 2.—Shows the buccal occlusion prior to treatment.

1. Class II, division 1 malocclusions, in which there is not more than half a unit post-normality and an increased overjet of approximately 4–5 mm., the lower arch being acceptable.

2. Some Class II, division 2 cases.

3. Cases where upper buccal segments have drifted forward due to either buccal or palatal misplacement of canines.

4. Class III cases with some degree of crowding in the upper buccal segments.

Extraction of upper second molars is frequently necessary in these cases because a shortness of dental base would not permit the

Demonstration given at the meeting held on May 9, 1960.

placing of all the cheek teeth in acceptable functional positions.

Favourable Factors in Treatment Planning.—The following favourable factors should be ascertained before planning treatment:—

1. Adequate length of upper buccal segment apical base.

may be needed. The first appliance is used to retract 76|67 and the second to retract 543|345.

Stage I.—Twin screw plate supported by extra-oral traction.—

Design.—Retention is vital, as insecurely inserted appliances do not work and tend to slip off the teeth on activation. Thus Adams

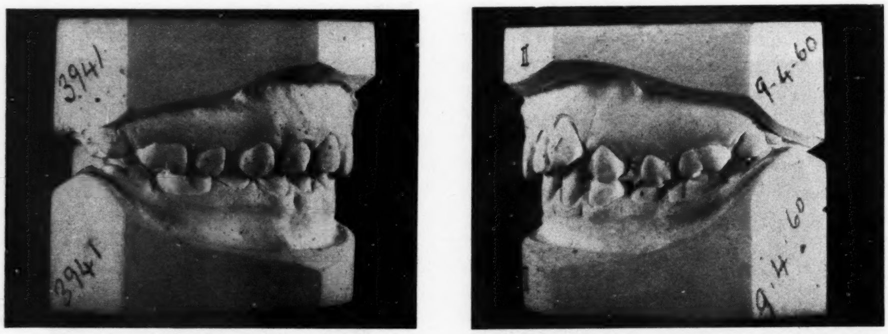

Fig. 3.—Shows the buccal occlusion when 76|67 were retracted. Note the amount 5|5 have followed distally although not included in the appliance.

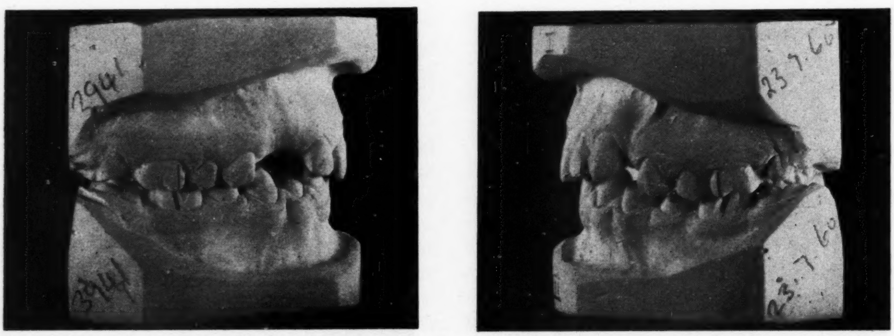

Fig. 4.—Shows the buccal occlusion with 7654|4567 fully retracted. Ample space has been provided for 3|3. Note that |3 has improved spontaneously.

2. Mesial inclination of 6|6.
3. No radiographic evidence of "stacking" of 876|678.
4. Shallow cusps and fossæ.

APPLIANCES

Generally, only two appliances are required, except where canines are in unfavourable positions, when a third appliance to aline these

Cribs on 64|46 are desirable. Also a strong 0·8 mm. low labial bow of the crossover type is placed slightly above the incisal edge of the incisors. This labial bow aids retention, provides additional anchorage, and is the means of attaching the extra-oral appliance.

Screws.—Glenross screws are used and are placed so that, on opening, the distal part of the plate moves in a distal and outward

direction along the line of the alveolar ridge. Incorrect placing may lead to failure of the appliance by pushing the teeth off the alveolar ridge, thereby throwing heavy strain on the anchorage. To decrease further the anchorage problem the screws are placed just anterior to $\underline{6|6}$, so that $\underline{76|67}$ (or $\underline{6|6}$ only in extraction cases) are moved.

Note that $\underline{5|5}$ are not pushed distally with the first appliance. However, they generally drift about three-quarters of the distance travelled by $\underline{6|6}$. The appliance is accordingly trimmed to permit $\underline{5|5}$ to move.

The screws are turned once per week on both sides. This gives 4 mm. movement in 4 months.

A bite platform, as small as is required, is used in all stages to avoid cuspal interference, especially if $\underline{7|7}$ are extracted, as then $\overline{7|7}$ may over-erupt.

Stage II.—When $\underline{76|67}$ are retracted (a little more than the exact amount is desirable), a second appliance is provided. This has the following design:—

1. Adams Cribs $\underline{6|6}$.
2. 0·8 mm. crossover labial bow.
3. 0·5 mm. finger springs to move $\underline{543|345}$ distally.
4. Slight bite platform.

The finger springs are activated in pairs; firstly $\underline{5|5}$ are activated simultaneously. These teeth are usually retracted in one month as they have already moved most of the distance required. Then $\underline{4|4}$ are retracted and finally $\underline{3|3}$, if required. Extra-oral anchorage is used throughout these movements.

Extra-oral Support.—All types may be used, but the type presented is generally employed because of its simplicity, ease of manipulation and construction, and its efficiency. It consists of:—

1. A length of polythene tubing of 1 cm. bore, measured to the patient's requirements.
2. Two pieces of 1 mm. S.S. wire, bent at both ends to hold the rubber band and for attachment to the appliance (*see Fig.* 1).
3. One No. 32 elastic band.

To receive the extra-oral support a U-bend is placed in the crossover labial bow just before it crosses over the mesial contact point of the upper canine into the acrylic.

Wearing of Appliances.—This should be continuous, especially during meals, to avoid cuspal interference; the extra-oral support being worn at night only.

Figs. 2–4 illustrate a case treated by the method described above:—

> P. J., aged 13, attended with $\underline{3|}$ in the palate and $\underline{|3}$ buccally placed with forward position of the upper buccal segments. $\underline{8|8}$ were missing. The lower arch was satisfactory.

Acknowledgements.—I wish to record my thanks to Mr. D. P. Walther, Director of the Orthodontic Department, Royal Dental Hospital of London, for permission to publish this case, and for his encouragement during the preparation; to the staff of the Photographic Department of the Royal Dental Hospital of London; and to Mr. E. D. McBride of the Royal Dental Hospital of London for technical assistance in preparing the models used at the demonstration.

The Use of Halothane in Dental Surgery

The choice of the necessary adjunct to nitrous oxide anæsthesia for dental operations requires special consideration because of the ever-present danger of explosion. Of all the medications associated with nitrous oxide for increasing its anæsthetic properties, only trichlorethylene is non-explosive. Sources of danger of this nature in a dental surgery are naked flames, non-spark-proof equipment, static electricity from "plastic" wearing apparel, and sparks let off when forceps make contact with teeth. Halothane is quite safe in this respect and, providing it is administered by one with experience and clinical acumen, it appears to be a more satisfactory adjunct to nitrous oxide–oxygen anæsthesia than any one hitherto used. The paper lists the properties of halothane and describes the technique of administration based on experience in nearly 2000 cases of all types.—Lortie, E. (1961), *J. Canad. dent. Ass.*, **27**, 77. G. E. B. Moore

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VOLUME XI, Nos. 1—12 (SEPTEMBER, 1960—AUGUST, 1961)

THE DENTAL PRACTITIONER *and* DENTAL RECORD

VOL. XI, NO. 12 AUGUST, 1961

[*Including the Transactions of the British Society for the Study of Orthodontics and the official reports of the British Society of Periodontology, the Glasgow Odontological Society, the Liverpool and District Odontological Society, the North Staffordshire Society of Dental Surgeons, the Odonto-chirurgical Society of Scotland, and the Dental and Medical Society for the Study of Hypnosis*]

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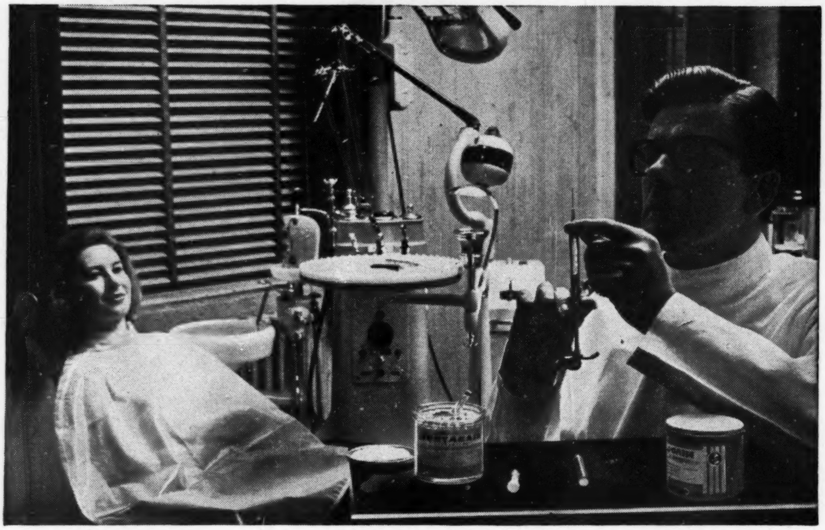

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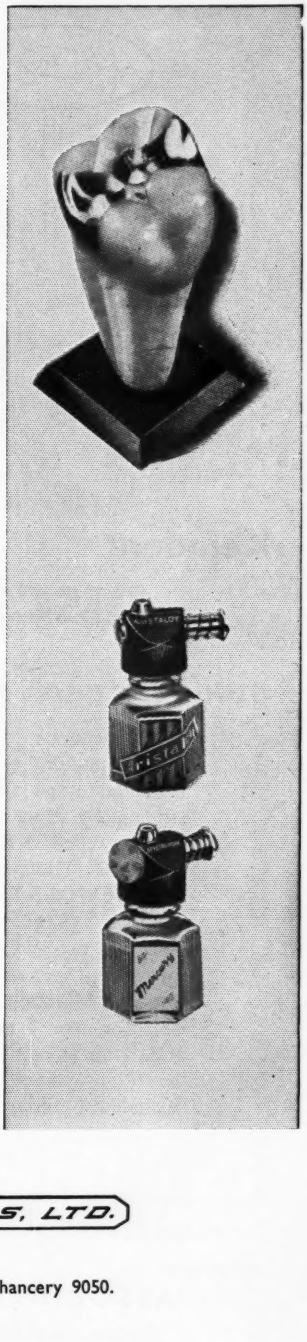

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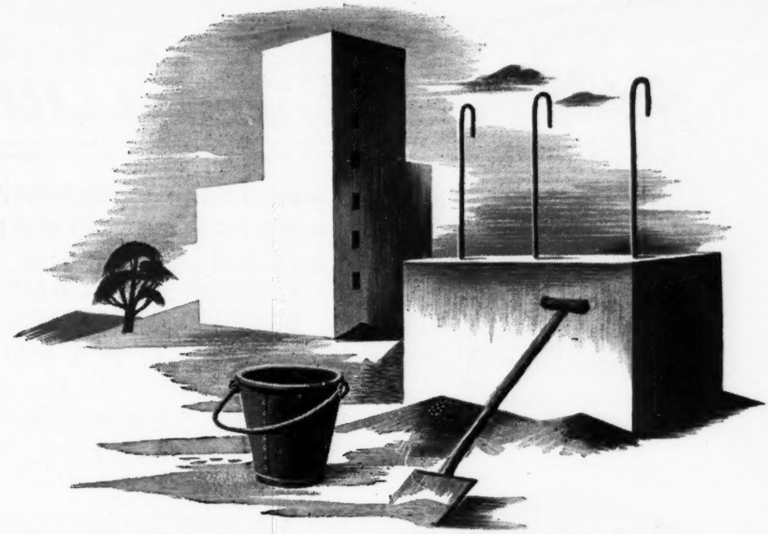

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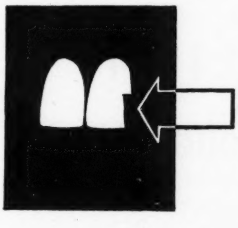

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